Abstract for Third Annual Conference on Carbon Capture and Sequestration
NETL

May 2–6, 2004
Alexandria, VA

Geologic CO_2 Storage Verification Monitoring: Preliminary Results for the Frio Pilot Test

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We are carrying out baseline measurements of CO_2 concentration and flux in the near-surface environment at South Liberty, Texas, site of a proposed CO_2 injection pilot test. The plan is to inject 3750 tonnes of CO_2 into the Frio Formation at a depth of approximately 1500 m (5000 ft). Pre-injection CO_2 monitoring at the site will provide a baseline against which post-injection CO_2 measurements can be compared to verify that injected CO_2 has not leaked from the deep Frio sands to the shallow subsurface from which it can seep out of the ground. Monitoring of CO_2 fluxes and concentrations is complicated by numerous natural carbon-cycle processes that produce CO_2 flux and concentration variations that can be larger than the CO_2 leakage or seepage signal (CO_2 LOSS). We propose an integrated measurement, monitoring, and modeling strategy that emphasizes cost- and time-efficient measurements designed to discern a CO_2 LOSS from background natural variability. We are using the accumulation chamber (AC) method to measure CO_2 flux at the ground surface, and soil-gas probes to collect gas samples at several depth intervals for CO_2 concentration and carbon isotopic determinations. A later phase of flux measurement is planned using the eddy correlation (EC) approach to capture the effects of the tree canopy on the total CO_2 budget. Preliminary pre-injection results will be presented and discussed.